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Victor L. Klimov

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EXAMINER

KUGEL, TIMOTHY J

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UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE BOARD OF PATENT APPEALS  
AND INTERFERENCES

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*Ex parte* VICTOR L. KLIMOV  
and  
MELISSA A. PETRUSKA

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Appeal 2009-002766  
Application 10/715,733  
Technology Center 1700

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Decided: December 31, 2009

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Before BRADLEY R. GARRIS, ADRIENE LEPIANE HANLON, and  
MARK NAGUMO, *Administrative Patent Judges*.

NAGUMO, *Administrative Patent Judge*.

DECISION ON APPEAL

A. Introduction<sup>1</sup>

Victor L. Klimov and Melissa A. Petruska (“Klimov”) timely appeal under 35 U.S.C. § 134(a) from the final rejection<sup>2</sup> of claims 1-12 and 17-27.<sup>3</sup> We have jurisdiction under 35 U.S.C. § 6. We REVERSE.

The subject matter on appeal relates to composite materials comprising colloidal nanocrystals dispersed in a sol-gel host matrix that further comprises an amphiphilic polymer. Semiconductor nanocrystals—also referred to as “nanocrystal quantum dots”—are so small that their energy levels and hence the light they emit, can be tuned by adjusting their size. Applications are said to range from luminescent biomarkers to lasing. Prior art nanocrystals dispersed in sol-gel hosts are said to have reduced photoluminescence quantum yields that limit their usefulness. The prior art composites are also said to be difficult to prepare, owing to the difficulty of matching surface-modifying capping groups that can be reacted with the sol-gel matrix to the colloidal nanocrystals. The claimed process is said to overcome these problems.

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<sup>1</sup> Application 10/715,733, *Nanocrystal/Sol-Gel Nanocomposites*, filed 17 November 2003. The specification is referred to as the “733 Specification,” and is cited as “Spec.” The real party in interest is listed as Los Alamos National Security, LLC. (Appeal Brief, filed 18 January 2008 (“Br.”), 2.)

<sup>2</sup> Office Action mailed 16 March 2007 (“Final Rejection”; cited as “FR”).

<sup>3</sup> Claims 13-16 have been withdrawn from consideration and are not before us. (FR 1.)

Representative Claim 1 is reproduced from the Claims Appendix to the Principal Brief on Appeal:

1. A process of preparing a solid composite including colloidal nanocrystals dispersed within a sol-gel host matrix, the process comprising:

admixing

colloidal nanocrystals with  
an *amphiphilic polymer* including both  
hydrophobic groups and hydrophilic groups  
within a solvent to form an alcoholic-soluble  
colloidal nanocrystal-polymer complex;

admixing

the alcohol-soluble colloidal nanocrystal-polymer  
complex and

a *sol-gel precursor material*; and,

forming said solid composite from said admixture.

(Br., Claims App., indentation, paragraphing, and emphasis added.)

The Examiner has maintained the following grounds of rejection:<sup>4</sup>

A. Claims 1, 2, 4-9, 17, 18, 20-23, and 25-27 stand rejected under 35 U.S.C. § 102(b) in view of the teachings of Barney.<sup>5</sup>

B. Claims 11, 12, 26, and 27 stand rejected under 35 U.S.C. § 102(b) , alternatively under 35 U.S.C. § 103(a), in view of the teachings of Barney.

C. Claims 3, 10, 19, and 24 stand rejected under 35 U.S.C. § 103(a) in view of the combined teachings of Barney and Bruchez.<sup>6</sup>

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<sup>4</sup> Examiner's Answer mailed 19 March 2008. ("Ans.").

<sup>5</sup> Alfred A. Barney et al., *Temperature-Sensing Composition*, U.S. Patent Application Publication US 2002/0110180 A1 (15 August 2002).

Klimov contends that the Examiner erred in finding that the lauryl methacrylate polymer (made by Barney in the presence of ZnS-capped CdSe nanocrystals) is an amphiphilic polymer. (Br. 7.) The structure of poly(lauryl methacrylate) shows, according to Klimov, that it has only hydrophobic groups. (*Id.*) Moreover, Klimov contends that the Examiner erred in finding that Barney, in paragraph [0031], teaches that the lauryl methacrylate polymer is combined with a sol-gel precursor material. Rather, Klimov argues, Barney teaches that the matrix could be either the polymer or the sol-gel matrix. (*Id.* at 8, ll. 3-7.) Klimov concludes that because Barney does not teach or suggest every limitation of the claimed subject matter, the rejection for anticipation should be reversed. For the same reasons, Klimov argues, the obviousness rejections, including the rejection further in view of Bruchez, should be reversed. (*Id.* at 12.)

The Examiner maintains that lauryl methacrylate polymers are amphiphilic due to the presence of the polar ether linkage and the nonpolar long chain hydrocarbon lauryl groups. (Ans. 6.) The Examiner also maintains that “Barney’s teaching of the solid composite of the nanocrystal-polymer complex and the sol-gel precursor at least implicitly teaches that the components were admixed.” (*Id.*)

An issue dispositive of this appeal is whether the prior art teaches or suggests a binder comprising the combination of poly(lauryl methacrylate) and a sol-gel precursor.

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<sup>6</sup> Marcel P. Bruchez et al., *Cells Having a Spectral Signature, and Methods of Preparation and Use Thereof*, U.S. Patent Application Publication US 2002/0155507 A1 (24 October 2002).

B. Findings of Fact

Findings of fact throughout this Opinion are supported by a preponderance of the evidence of record.

1. Barney describes temperature-sensing compositions comprising a semiconductor nanocrystal dispersed in a matrix. (Barney 1, ¶ [0005].)
2. According to Barney, “[t]he nanocrystals can be processed with a binder to form a matrix, which can be varied by altering the chemical nature of the surface of the nanocrystal.” (Barney 1, ¶ [0005].)
3. More specifically, Barney teaches that “[t]he outer surface of the nanocrystal can include layer of compounds derived from the coordinating solvent used during the growth process.” (Barney 3, ¶ [0029].)
4. For example, the overlayer-forming compound may have a reactive group that can react to bond the nanocrystal to the binder, which in turn can form a matrix. (Barney 3, ¶ [0030].)
5. In Barney’s words, “[t]he matrix can be an organic polymer matrix, such as a polyacrylate matrix, or an inorganic matrix, such as a sol-gel-derived matrix.” (Barney 3, ¶ [0030].)
6. In particular, Barney describes ZnS-capped CdSe nanocrystals in a poly(lauryl methacrylate) matrix used to obtain the luminescence emission spectra shown in Figure 1 (not reproduced here). (Barney 1, ¶ [0015].)
7. The nanocrystal-binder matrix was formed by dispersing the nanocrystals in lauryl methacrylate monomer containing tri-n-octylphosphine (Barney 3, l. 3), adding ethyleneglycol dimethacrylate

as a cross linking agent and an initiator, and polymerizing the sample in an oven (*id.* at 4, ¶ [0039]).

8. Barney does not describe a nano-crystal binder matrix comprising an organic polymer and a sol-gel precursor.

### C. Discussion

As the Appellant, Klimov bears the procedural burden of showing harmful error in the Examiner's rejections. *See, e.g., Gechter v. Davidson*, 116 F.3d 1454, 1460 (Fed. Cir. 1997) (“[W]e expect that the Board's anticipation analysis be conducted on a limitation by limitation basis, with specific fact findings for each contested limitation and satisfactory explanations for such findings.”).

Processes covered by appealed claim 1 comprise three steps: admixing colloidal nanocrystals with an amphiphilic polymer in a solvent; admixing the nanocrystal-polymer complex with a sol-gel precursor material; and forming a solid composite.

Review of Barney indicates, as Klimov argues, the absence of credible evidence supporting the Examiner's initial finding that Barney teaches the admixture of poly(lauryl methacrylate) and a sol-gel composition to form a binder. Rather, as Klimov points out, Barney teaches the organic polymer matrix and the inorganic matrix in the alternative. Nor is there any credible evidence supporting the Examiner's tardy argument that Barney “implicitly teaches” such a combination. This failure of supporting evidence suffices to REVERSE all the rejections, as the additional arguments and evidence relied

on by the Examiner are directed to other limitations and do not cure this defect.

While we need not reach the dispute over the status of poly(lauryl methacrylate) (“pLM”) as an “amphiphilic” polymer containing both hydrophilic and hydrophobic groups, the formal aspects of the “arguments” pro and con raise instructive concerns.

The Examiner, in effect, took “official notice” of the status of pLM as an amphiphilic polymer, and hence, official notice that the hydrocarbon chains are hydrophobic and the ester linkages are hydrophilic. While the Examiner and Klimov do not disagree that the hydrocarbon chains are hydrophobic, neither has come forward with direct evidence regarding the properties of the ester group. At best, Klimov has challenged the Examiner’s official notice: but the challenge is weak, as the only evidence provided is the structure of the polymer, and the critical contention of the Examiner—that the ester linkage is hydrophilic—is merely dismissed without further explanation. Attorney argument is not a substitute for evidence. Moreover, as our reviewing court has remarked in a related context, “[e]ven were it obvious to a practitioner of the art [that the results were unexpected], applicants have the burden to provide the PTO with evidence showing such is the case.” *In re Mayne*, 104 F.3d 1339, 1344 (Fed. Cir. 1997). It is fortunate that this virtual balance of minimal evidence presented by either side is not the dispositive issue in this case; but it should be sobering to both the Examiner and Appellants to understand that the disposition of this Appeal could have been based on an assessment of who had failed to carry their burden on this point. The irony of such a resolution



would have been particularly strong in this case, in which the 733 Specification describes hydrophobic regions of amphiphilic polymers as being associated with monomers such as acrylates and methacrylates. (Spec. 8, ll. 16-26), with lauryl methacrylate mentioned specifically as a hydrophobic monomer (*id.* at l. 21). Neither the Examiner nor Appellants should expect the Board to carry their respective burdens, scouring the record for evidence supporting the position of either.

D. Order

We REVERSE the rejection of claims 1, 2, 4-9, 17, 18, 20-23, and 25-27 under 35 U.S.C. § 102(b) in view of the teachings of Barney.

We REVERSE the rejection of claims 11, 12, 26, and 27 under 35 U.S.C. § 102(b) , alternatively under 35 U.S.C. § 103(a), in view of the teachings of Barney.

We REVERSE the rejection of claims 3, 10, 19, and 24 under 35 U.S.C. § 103(a) in view of the combined teachings of Barney and Bruchez.

No time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136(a).

REVERSED

tc

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